

### REMARKS

Claims 1, 2, 4, 5 and 22-26 are pending. Claims 1 and 22 have been amended. Claims 24, 25 and 26 have been added. Of the pending claims, nos. 1, 22 and 26 are independent.

The Office Action objected to claim 1 because "drain layer" in line 8 of that claim should have read "high concentration drain layer." Applicants have amended claim 1 accordingly.

Claims 1, 2 and 4 were rejected under 35 U.S.C. §102(e) as allegedly being anticipated by U.S. Patent No. 6,259,136 (Kawaguchi et al.). Applicants respectfully disagree.

Claim 1 recites a semiconductor device with a gate electrode and a body layer that is formed *only* under the gate electrode. An example of that feature is shown in FIG. 12(b) of the present application where p-type body layer 18A is formed *only* under gate electrode 27F. No portion of the p-type body layer extends beyond the edges of the gate electrode 27F. Certain implementations of that feature result in a semiconductor device that is advantageously compact. The Kawaguchi et al. patent neither discloses nor suggests that feature.

The Kawaguchi et al. patent discloses a high-breakdown-voltage semiconductor device. (See, FIG. 3) That device includes an n-type source layer 13 and an n-type drain layer 16 formed above a p-type semiconductor substrate 11. A gate electrode 19 is formed on a channel layer and is between the n-type source layer 13 and the n-type drain layer 16. A p-type body layer 12 is in direct contact with the n-type source layer 13. A first n-type offset layer 14 and a second n-type offset layer 15 are formed between the channel layer and the n-type drain layer 16.

Only a portion of the p-type body layer 12 in FIG. 3 of the Kawaguchi et al. patent is formed under the gate electrode 19. The rest of the p-type body layer 12 extends outward beyond the gate electrode 19. Of course then, the p-type body layer 12 is not formed only under the gate electrode 19.

Claim 1 should be allowable for at least the foregoing reason.

Claims 2 and 4 depend from claim 1 and, therefore, should be allowable for at least the same reasons as claim 1.

Claim 5 was rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over the Kawaguchi et al. patent in view of U.S. Patent No. 5,844,272 (Soderbarg et al.)

Claim 5 depends from claim 1, which recites a semiconductor device with a gate electrode and a body layer that is formed *only* under the gate electrode. As discussed above with reference to claim 1, the Kawaguchi et al. patent neither discloses nor suggests that feature. Nor does the Soderbarg et al. patent disclose or suggest that feature.

Instead, the Soderbarg et al. patent merely discloses a semiconductor component for high voltage that has an (n-) region at a side of a p-doped body 22. (*See*, FIG. 3) That component includes an extended gate layer 30. Under the extended gate layer 30 are a portion of an (n-) channel 21 and a portion of a p-doped body 22, both of which extend beyond the edges of the extended gate layer 30. Neither the (n-) channel 21, nor the p-doped body 22 are formed only under the gate electrode.

Claim 5 should be allowable for at least that reason.

Claims 22 and 23 were rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over U.S. Patent No. 5,576,574 (Hong), in view of U.S. Patent No. 5,926,712 (Chen et al.)

Applicants have amended claim 22 to recite a semiconductor device with a body layer that protrudes from the low concentration source and drain layers in a downward direction. An example of that is shown in FIG. 10(b) of the present application where body layer 19 protrudes from the low concentration source and drain layers 11 in a downward direction. In certain implementations, that feature helps prevent undesirable leakage current from flowing between the source and drain layers. Neither the Hong patent nor the Chen et al. patent disclose or suggest that feature.

The Hong patent discloses second type heavily doped N<sup>+</sup> source/drain regions 270a, 270b formed on a p-type semiconductor material 2. (*See*, FIG. 2f) A gate 26 is formed above

and between the second type heavily doped N+ source/drain regions 270a, 270b via a gate insulator 220. A p-type channel region 250 is formed under the gate 26 and is formed apart from the second type heavily doped N+ source/drain regions 270a, 270b. Second type lightly doped regions 210a, 210b are adjacent the second type heavily doped N+ source/drain regions 270a, 270b. The second type lightly doped regions 210a, 210b are separated from each other by the channel region 250 and the channel region 250 is in direct contact with the second type lightly doped regions 210a, 210b. An anti-punchthrough region 252 is formed under the channel region. (column 3, lines 39-41) Neither the channel region 250 nor the anti-punchthrough region amounts to a body layer that protrudes from low concentration source and drain layers in a downward direction, as is recited in claim 22.

The channel region 250 disclosed in the Hong patent does not protrude from the second type low concentration regions 210a, 210b *in a downward direction*, as featured in claim 22. As clearly indicated in FIG. 2f, the channel region 250 is formed entirely between those two regions 210a, 210b. No portion of the channel region extends *in a downward direction* from those regions 210a, 210b.

The anti-punchthrough region 252 disclosed in the Hong patent simply does not protrude from the second type lightly doped regions 210a, 210b, as featured in claim 22. Indeed, the anti-punchthrough region does not contact the second type lightly doped regions at all. Instead, it extends from the channel region 250, which is positioned between the second type lightly doped regions 210a, 210b.

The Chen et al. patent discloses (n-) type first source/drain regions 216 that respectively surround (n+) type third source/drain regions 219. (See, FIG. 2(f)) The Chen et al. patent simply does not disclose a body layer that protrudes from the low concentration source and drain layers in a downward direction, as is recited in claim 22.

Claim 22 should be allowable for at least the foregoing reasons.

Claims 23-25 depend directly or indirectly from claim 22 and, therefore, should be allowable for at least the same reasons as claim 22.

New claims 24 and 25 should be allowable for the following additional reasons as well.

New claim 24 (in conjunction with claim 22) features a body layer that 1) is below and in direct contact with a gate oxide film; and 2) protrudes from low concentration source and drain layers in a downward direction. An example of that is shown in FIG. 10(b) where body layer 19 is below and in direct contact with gate oxide film 9 and protrudes from low concentration source and drain layers 11 in a downward direction. No new matter has been added. Certain implementations of the subject matter in claim 24 reduce the flow of leakage current between the source and drain regions.

Neither the Hong patent nor the Chen et al. patent discloses or suggests a body layer that: 1) is below and in direct contact with a gate oxide film; and 2) protrudes from low concentration source and drain layers in a downward direction, as featured in claim 24.

Claim 24 should be allowable for at least the foregoing additional reasons.

New claim 25 recites that the body layer has an approximately uniform width from the gate oxide film to a bottom surface of the body layer. An example of that is shown in FIG. 10(b) where the body layer 19 has an approximately uniform width from the gate oxide film 9 to its bottom surface. No new matter has been added. In certain implementations, that feature further enhances a semiconductor device's ability to suppress the flow of leakage current.

Neither the Hong patent nor the Chen patent discloses or suggests a body layer that: 1) is below and in direct contact with a gate oxide film; 2) protrudes from low concentration source and drain layers in a downward direction; and 3) has an approximately uniform width from the gate oxide film to a bottom surface of the body layer, as featured in claim 25 (in conjunction with claims 22 and 24).

Claim 25 should be allowable for at least the foregoing additional reasons.

New independent claim 26 is also allowable, for at least the following reasons.

Claim 26 is similar to claim 22 but recites that the body layer is in direct contact with the low concentration source and drain layers along portions of each side of the body layer, and that

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the body layer extends in a downward direction below the bottom-most points of contact of the body layer with the low concentration source and drain layer. Again, an example of that is shown in FIG. 10(b). No new matter has been added. This arrangement is not disclosed or suggested by the Hong or Chen et al. references, as explained above.

It is believed that all of the pending claims have been addressed. However, the absence of a reply to a specific rejection, issue or comment does not signify agreement with or concession of that rejection, issue or comment. In addition, because the arguments made above may not be exhaustive, there may be reasons for patentability of any or all pending claims (or other claims) that have not been expressed. Finally, nothing in this paper should be construed as an intent to concede any issue with regard to any claim, except as specifically stated in this paper, and the amendment of any claim does not necessarily signify concession of unpatentability of the claim prior to its amendment.

Enclosed is a \$790.00 check for the request for continued examination (RCE) fee. Please apply any other charges or credits to deposit account 06-1050.

Respectfully submitted,

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